

REMARKS

In response to the Office Action mailed November 17, 2004, Applicant amends his application and requests reconsideration. In this Amendment claims 15, 16, and 20 are newly cancelled leaving claims 14 and 17-19 pending.

In the foregoing amendment, the limitations of former claims 15 and 16 are incorporated into independent claim 14. In addition, the penultimate paragraph of claim 14 is clarified. The particles in the slurry being referred to are identified as the polishing particles. There may be other particles in the slurry that do not polish the object. In addition, the slurry for which the particle information is obtained is defined as the slurry supplied directly to the object, not some component of a further mixture that is supplied to the object.

Of the claims having limitations still pending in this patent application, claims 14 and 17-19 were rejected as anticipated by Yueh (U.S. Patent 5,791,970). Former claim 16 was rejected as unpatentable over Yueh in view of Shelton et al. (U.S. Patent 6,117,779, hereinafter Shelton). Thus, it would appear that the applicable rejection of independent claim 14, in view of the combination of claims 14-16, and of the other remaining claims, is that those claims might be asserted to be obvious over Yueh in view of Shelton. This potential rejection is respectfully traversed.

In reply to the comments at the beginning of the Office Action, Applicant calls upon the Examiner to supply information supporting his assertion that some valve, presumably valve 35, of Yueh is a 3-way valve so that the apparatus of Yueh can operate. At page 3 of the Official Action the Examiner stated that Yueh "both describes in the text and clearly illustrates a 3-way valve." There is no such description anywhere within the text of Yueh. The Examiner has not pointed to any such description by column or line number. Nothing in the figures of Yueh supports the Examiner's position, absent supplementary information that has not been produced. Applicant again challenges the Examiner and the rejection to cite published prior art or other cognizable information if this position is maintained.

All comments and arguments made regarding the previous rejections are maintained even if not set out at length. The most important of those arguments is that Yueh is improperly applied in rejecting any claim here because Yueh lacks an enabling disclosure with regard to points that are essential to the rejection, contrary to the Examiner's position. Therefore, Yueh cannot be considered prior art pursuant to MPEP 2121 and must be withdrawn. As previously pointed out, there is no description in Yueh as to how the controller 41 operates and even less description with regard to the structure or operation of the end point monitor 40. Contrary to the Examiner's assertion, understanding the operation of these elements of Yueh is crucial to the rejection of the claims. The Examiner stated at page 4 of the Office Action that Yueh describes

measuring the dispersion of particles and distribution of particle sizes and controls polishing speed based upon that particle information. Referring to the very brief description of Yueh, the criticality of the operation of the end point monitor 40 of Yueh to controlling polishing is plainly apparent.

“That is to say, when the removal rate is high, a greater amount of particulate matter is present in the slurry and more slurry is disposed of with less slurry being passed by the valve [35]... . No prior art end point monitoring system is capable of supplying instantaneous wafer removal rate data with high accuracy... . The end point monitoring system is indicated by block 40. This system is under the control of a controller 41 which may comprise any microprocessor... . The controller also controls the stir mechanism 42 and a valve 43 response of the particle size sensor 31 for admitting newly prepared slurry to tank 29 to achieve the desired particle size distribution”
Column 3, lines 19-37.

The assertion at the top of page 3 of the Office Action that the argument that Yueh is non-enabling is not persuasive because “[f]urther specifics of controller 41, end-point monitor 40 and valve 49 are not essential to the rejection as recited below” simply cannot withstand logical analysis. Polishing speed is somehow controlled in Yueh by the controller 41 through the end point monitor 40. Those elements are totally central to controlling polishing in Yueh and matching Yueh to the final step of claim 14. Absent an enabling disclosure, Yueh cannot meet at least that limitation of claim 14. If the Examiner desires to maintain his position that Yueh is enabling, then he must cite a prior art printed publication proving that Yueh includes a enabling disclosure, based upon what is known in the prior art, or supply his own declaration, pursuant to 37 CFR 1.104(d)(2), if the Examiner relies on personal knowledge for this or any other element of the rejection.

Applicant has taken an extra step, not required, in further proof that Yueh is non-enabling by citing the patent that issued from the co-pending patent application to Yueh that is referred to only by application number in Yueh. As previously described, that disclosure likewise is inadequate to enable Yueh.

Several important points are made in amended claim 14. Among them, in clarifying the claim, it is pointed out that the measuring of the particle information of the polishing particles is made of the slurry being directly supplied to the object in the polishing apparatus. No matter how the comments of the most recent Office Action are rearranged, Yueh does not describe nor suggest the step. According to Yueh, the particle sensor 31 measures some kind of particle

information with regard to slurry within the tank 29. When the desired distribution of particle size, apparently in some log normal distribution, is not present within the tank 29, then the particle size sensor 31 actuates the valve 43 to admit new slurry to the tank 29 in order to alter the particle size distribution of the slurry within that tank. However, the slurry within that tank is not the slurry that is directly supplied to the slurry dispensing slot 17. The slurry from the tank 29 first passes through a valve 49 “which controls the passage of recycled or fresh slurry...”. This valve 49 “is controlled also by the end point monitoring system (40) that provides instantaneous wafer thickness information with high precision, in addition to wafer removal rate data used in controller valve 35.”

It is evident that there is no explanation in Yueh as to how the end point monitoring system 40 controls the valve 49, i.e., what stimulus causes the valve 49 to change its opening and in which direction, i.e., more open or more closed. The absence of this disclosure again points out that whatever Yueh’s process is and how it operates is not disclosed in Yueh in detail sufficient to enable one of ordinary skill in the art to practice the Yueh disclosure. Yueh is a non-enabling disclosure that cannot properly be used in rejecting any claim in the present patent application. In addition, if Yueh wished to obtain particle size information for the slurry that is being supplied to his slot 17, then the particle size sensor 31 would not be sensing the particle size distribution in the tank 29. Rather, Yueh would measure the particle size distribution between the valve 49 and the slot 17, for example at the pump 34 shown in Figure 2 of Yueh. That location is the location of particle size information measurement in claim 14. Because of the location of the particle size detector 31 in Yueh, Yueh does not disclose and cannot suggest the second step of the method of claim 14.

Yueh fails to inform what variables control valve 49, presumably a mixing valve, to supply more fresh slurry or less fresh slurry in relation to the mixture of recycled and fresh slurry supplied from the tank 29 to valve 49. Clearly, whenever fresh slurry is admitted by valve 49, the particle size distribution determined by the sensor 31 is different from the particle size distribution of the slurry that is supplied to the slot 17. A person of skill in the art is left to guess how this system operates but can clearly comprehend that the particle size distribution of the slurry mixture passing through the pump 34 is unknown, or only guessed at, not measured, contrary to the present invention.

In the foregoing amendment, the limitations of claims 14 and 16 have been incorporated into amended claim 14. Apparently it had been the Examiner’s position that the particle size distribution of the slurry is a physical variable of the polisher. This position is clearly erroneous in view of the definition of physical variables in examined claim 16, which is now part of claim

14. Thus, it is presumed that this portion of the rejection based solely upon Yueh is now withdrawn.

Claim 16 was rejected as obvious over Yeuh in view of Shelton. Shelton was relied upon for numerous elements of the claimed invention, particularly controlling polishing speed based upon one of rotation speed of the polisher, rotation speed of the object, and force supplied by the polisher to the object. As to these items, Applicant agrees that Shelton describes a polishing apparatus for semiconductor wafers in which rotation speed of the polisher, rotation speed of the object, and force supplied by the polisher to the object are all variable. Moreover, Shelton states that semiconductor wafer polishing apparatus including the ability to vary these rotation speeds and the force applied to the object being polished is conventional. Of course, what was claimed in claim 16 and now claimed in amended 14 is not merely the existence of the variables in a polishing apparatus, but a method of polishing an object, such as a semiconductor wafer, in which the polishing speed of the object is controlled based upon "the particle information". As clarified in amended claim 14, the particle information relates to at least one of dispersion of *the polishing particles* in the slurry and the distribution of particle sizes of *the polishing particles* of the slurry. Shelton never discloses and, in fact, teaches away from measuring this kind of particle information to control the polishing speed of a semiconductor wafer.

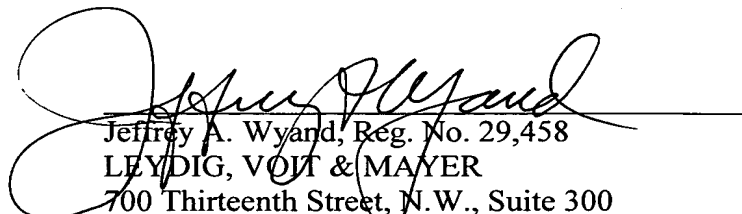
The whole thrust of Shelton is determining an end point of a polishing process by detecting a presence of platinum particles in the discharged slurry. The platinum particles are implanted in a particular layer of a multiple layer structure deposited on the semiconductor wafer being polished. Then, as this layer including the platinum particles is exposed, the platinum particles become mixed in the slurry that is discharged. The platinum particles are not, of course, polishing particles but are, essentially, a contaminant in the slurry being discharged. One of skill in the art would understand that, inherently, it would be impossible to accomplish the Shelton objective if the discharged slurry were recycled by itself or mixed with fresh slurry. That result would completely destroy the sensitivity of the apparatus for detecting the presence of the platinum particles because the recycled slurry would contain the platinum particles from the previous polishing process. Stated another way, nothing within Shelton would commend it to anyone of skill in the art for modifying Yueh since the entire thrust of Yueh is to recycle previously used slurry.

Even if the parts of the polishing apparatus described by Shelton as conventional were adopted in the Yueh apparatus, the method of amended claim 14 would still not be produced. Nothing in either Yueh or Shelton describes or suggests adjusting any of rotation speed of the polisher, rotation speed of the object, or force applied to the object by the polisher *based on the*

particle information. Attention is directed to the disclosure of Shelton with regard to its Figure 3 beginning at column 10, line 35, describing the process of operating the Shelton apparatus. All that is disclosed is identifying an end point of the polishing process by the detection of the platinum particles, without reference to altering any speed of any part of the polishing apparatus or the force applied to the object being polished. As acknowledged in the Office Action, there is no description of varying any of these parameters in Yueh, necessitating the reliance upon Shelton. Yueh does make reference to wafer removal rate information in the paragraph in column 3 beginning in line 38 cited above. However, this disclosure is insufficient, even with any potential modification by Shelton, to provide the elements of the final paragraph of amended claim 14. Accordingly *prima facie* obviousness of that claim cannot be established by the proposed combination of Yueh and Shelton.

For each of the foregoing reasons, the rejection as to amended claim 14 should be withdrawn. Among these reasons, each of which is independently sufficient for allowing claim 14, is that Yueh is not an enabling disclosure and not available as prior art, and that Yueh does not describe the measuring polishing particle information of the slurry used in polishing. Shelton does not suggest any modification of Yueh, much less a modification in which polishing rate is controlled based upon information concerning distribution of polishing particle size and/or dispersion in the slurry that is supplied directly to the object being polished. Upon withdrawal of that rejection with regard to amended claim 14, that claim and its dependent claims 17-19, should be allowed.

Respectfully submitted,



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